

# PATENT ABSTRACTS OF JAPAN

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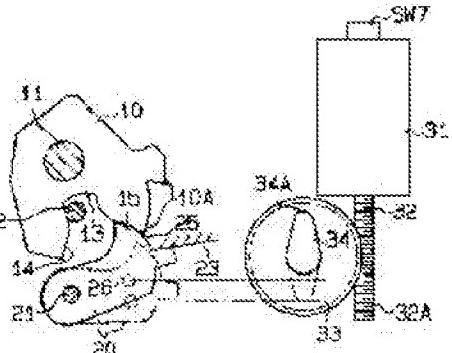
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## (54) DOOR LOCK DEVICE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a door lock device capable of being simply constructed and being miniaturized by combining a latch mechanism with an actuator, reducing the number of components.

**SOLUTION:** A ratchet mechanism is equipped with a latch cam 10 fitting a striker 12 thereto and turned against elastic force of a first spring by the striker 12 and a ratchet 20 turning to the interlocking surface 15 formed in the latch cam 10 with elastic force of a second spring to interlock when the turning latch cam 10 is turned up to a specific position settled in advance and preventing the turning in the opposite direction of the latch cam 10 to prevent the separation of the striker 12. A driving cam 34 turning together with a DC motor 31 is interlocked with the ratchet 20, and the ratchet 20 is turned in the opposite direction to release the interlock with the latch cam 10.



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**CLAIMS**

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**[Claim(s)]**

**[Claim 1]**A door lock device comprising:

A latch cam (10) which fits in, resists elastic force of the 1st elastic member (16), and rotates a striker (12) by the striker (12).

When the latch cam (10) to rotate rotates to a prescribed position defined beforehand, to a formed engagement part (15) to the latch cam (10) according to elastic force of the 2nd elastic member (22). A ratchet mechanism which consists of a ratchet (20) which rotates, is engaged, prevents rotation of a counter direction of the latch cam (10), and prevents secession of said striker.

An actuator which engages with a ratchet (20) of said ratchet mechanism, resists elastic force of said 2nd elastic member (22), and makes a counter direction rotate the ratchet (20) and of which engagement to said latch cam (10) is made to cancel (31, 34 grades).

**[Claim 2]**A door lock device comprising:

A latch cam (10) which fits in, resists elastic force of the 1st elastic member (16), and rotates a striker (12) by the striker (12).

When the latch cam (10) to rotate rotates to a prescribed position defined beforehand, to a formed engagement part (15) to the latch cam (10) according to elastic force of the 2nd elastic member (22). A ratchet mechanism which consists of a ratchet (20) which rotates, is engaged, prevents rotation of a counter direction of the latch cam (10), and prevents secession of said striker.

Engage with a ratchet (20) of said ratchet mechanism, and elastic force of said 2nd elastic member (22) is resisted in the ratchet (20). A door opening switch for making an actuator (31, 34 grades) of which rotate a counter direction and engagement to said latch cam (10) is made to cancel, and said actuator (31, 34 grades) drive, and making a counter direction rotate said ratchet (20) (SW4, SW5).

A lock switch (SW1-SW3) for making impossible a drive of said actuator (31, 34 grades), An unlocking switch (SW1, SW2) for enabling a drive of said actuator (31, 34 grades), A controlling circuit part (40) which validates operation of said door opening switch (SW4, SW5) for operation of said door opening switch (SW4, SW5) invalid based on operation of said unlocking switch (SW1, SW2) based on operation of said lock switch (SW1-SW3).

**[Claim 3]**The door lock device comprising according to claim 1 or 2:

Said actuator is an electric actuator and is a direct-current motor (31).

A driving cam (34) which rotates and makes a counter direction rotate said ratchet (20) with rotation of the direct-current motor (31).

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[Translation done.]

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

[Field of the Invention]This invention relates to a door lock device.

**[0002]**

[Description of the Prior Art]Generally, the door for cars is equipped with the ratchet mechanism and the locking mechanism, for example so that clearly from JP,7-122367,B etc. When a door is shut, a ratchet mechanism is a mechanism in which the state where it was closed is held, unless the handle for open provided inside outside the door is operated. Even if a locking mechanism operates the handle for open [ said ], it is a mechanism in which a door is held in the closed state.

[0003]When a door is shut, a ratchet mechanism rotates the latch cam which the striker provided in the body side provided in the door side, and makes the striker and a latch cam engaged. the ratchet which provided the latch cam in the door side at this time --- being engaged --- it becomes rotation impossible and it becomes impossible to change a rotation return into the original state As a result, a door will be in the closed state and what is called a latch condition. And this latch condition is canceled by operating a handle. That is, the connection lever connected between the handle and said ratchet transmits an operating physical force on a knob to RACHET, and rotates a ratchet. As a result, a latch cam will be released by the rotation and the ratchet of a door will be in the Anh latch condition.

[0004]On the other hand, the locking mechanism is constituted by the electric actuator which is provided between the connection lever and ratchet of said ratchet mechanism, and operates a link and this link. This link is arranged at the state of two positions of a locked position where a ratchet is not rotated, even if the unlocked position and connection lever which are changed into the state of rotating a ratchet in said connection lever operate. And two positions of this link are performed in an electric actuator. That is, if a link is fixed to a locked position in an electric actuator, even if a connection lever tends to rotate a ratchet by operation on a knob, the transmission force will not be transmitted to a ratchet by the link in said lock 1, and the ratchet will not be rotated. As a result, the door which is in a latch condition according to a ratchet mechanism serves as as [ locked position ], unless a link returns to an unlocked position in said electric actuator.

**[0005]**

[Problem(s) to be Solved by the Invention]By the way, said locking mechanism comprises an electric actuator which is provided between the connection lever and ratchet of said ratchet mechanism, and operates a link and this link. Since it was a mechanism for changing this link into a non-locked position and a locked position by being arranged in an unlocked position and a locked position, that structure was complicated. The locking mechanism had many the Wakebe article mark, was large-sized, and had become a high cost.

[0006]While this invention is made in order to cancel the above-mentioned problem, and the purpose can simplify the structure and being able to aim at reduction of part mark, it is in providing the door lock device which can attain a miniaturization.

**[0007]**

[Means for Solving the Problem] A latch cam which an invention of claim 1 fits in a striker, and resists elastic force of the 1st elastic member and is rotated in the striker. A ratchet mechanism which consists of a ratchet which rotates according to elastic force of the 2nd elastic member, is engaged to an engagement part formed in the latch cam, prevents rotation of a counter direction of the latch cam, and prevents secession of said striker when the latch cam to rotate rotates to a prescribed position defined beforehand. Let a door lock device which consists of an actuator which engages with a ratchet of said ratchet mechanism, resists elastic force of said 2nd elastic member, and makes a counter direction rotate the ratchet, and of which engagement to said latch cam is made to cancel be the gist.

[0008] A latch cam which an invention of claim 2 fits in a striker, and resists elastic force of the 1st elastic member and is rotated in the striker. A ratchet mechanism which consists of a ratchet which rotates according to elastic force of the 2nd elastic member, is engaged to an engagement part formed in the latch cam, prevents rotation of a counter direction of the latch cam, and prevents secession of said striker when the latch cam to rotate rotates to a prescribed position defined beforehand. An actuator which engages with a ratchet of said ratchet mechanism, resists elastic force of said 2nd elastic member, and makes a counter direction rotate the ratchet and of which engagement to said latch cam is made to cancel. A door opening switch for making said actuator drive and making a counter direction rotate said ratchet, A lock switch for making a drive of said actuator impossible, and an unlocking switch for enabling a drive of said actuator. Let a door lock device which consists operation of said door opening switch of a controlling circuit part which validates operation of said door opening switch based on operation of said unlocking switch invalid be the gist based on operation of said lock switch.

[0009] An invention of claim 3 consists of a driving cam which said actuator rotates [driving cam] with rotation of a direct-current motor and its direct-current motor, and makes a counter direction rotate said ratchet in the door lock device according to claim 1 or 2.

[0010] According to the invention of claim 1, when a latch cam and a ratchet are in an engagement state, unless an actuator makes a counter direction rotate the ratchet, the engagement state is not canceled.

[0011] A controlling circuit part will not make an actuator according to the invention of claim 2, drive, when a lock switch is operated, even if a door opening switch is operated. A controlling circuit part makes an actuator drive promptly, when an unlocking switch is operated, when a door opening switch is operated.

[0012] According to the invention of claim 3, when a direct-current motor rotates, a driving cam also rotates, a ratchet engages with the driving cam to rotate, and it rotates to a counter direction.

[0013]

#### [Embodiment of the Invention]

(A 1st embodiment) The 1 embodiment which materialized this invention to the door lock device adopted as the door for cars hereafter is described according to a drawing. An important section front view for drawing 1 to explain the ratchet mechanism built in the door of the side of a driver's seat and drawing 2 are the important section front views showing the latch condition of a ratchet mechanism similarly. Drawing 3 is an important section front view showing the locking mechanism allocated by the back of the ratchet mechanism shown in drawing 1.

[0014] In drawing 1, the latch cam 10 is allocated by the substrate allocated inside the frame of a door side face, and is supported rotatable focusing on the axis 11. The crevice 13 which the U-shaped striker 12 which formed the latch cam 10 in the frame of the vehicle body invades, and is engaged is formed. In drawing 1, an upper part opening forms up the shape of slant 14, i.e., the cutout surface cut and lacked so that it might be extended, and, as for the crevice 13, forms the passage passage of the striker 12. The field of the opposite hand of the cutout surface 14 of the crevice 13 is made into the engagement face 15 as an engagement part, in drawing 1 [as opposed to / the striker 12 which trespasses upon the crevice 13 contacts, and / the latch cam 10 of the striker 12] --- rightward relative displacement --- the latch cam 10 is both rotated in the counter clockwise direction in drawing 1.

[0015] As for the latch cam 10, elastic force is given to clockwise direction in drawing 1 by the

1st spring 16 as the 1st elastic member. The 1st stopper 17 is allocated on the rotation orbit of the latch cam 10, it engages with the stopper surface 18 formed in the latch cam 10, and rotation of the latch cam 10 of the clockwise direction beyond it is regulated. The rotating position of the latch cam 10 which is shown in drawing 1 and by which rotation regulation was carried out is a position which permits that said striker 12 passes the lower part of the cutout surface 14 toward said engagement face 15, when the cutout surface 14 of said crevice 13 is in a horizontal state and a door is shut.

[0016]The ratchet 20 is allocated in said latch cam 10 bottom, and the ratchet 20 is supported rotatable focusing on the axis 21. As for the ratchet 20, in drawing 1, elastic force is given in the counter clockwise direction by the 2nd spring 22 as the 2nd elastic member. The 2nd stopper 23 is allocated on the rotation orbit of the ratchet 20, it engages with the stopper piece 24 formed at the tip of the ratchet 20, and rotation of the ratchet 20 of the counter clockwise direction beyond it is regulated.

[0017]The nail 25 is formed in the tip part latch cam side of the ratchet 20. The nail 25 contacts the cam surface 10A formed in the peripheral face of the latch cam 10 according to the elastic force of said 2nd spring 22. Therefore, if said latch cam 10 resists the elastic force of the 1st spring 16 and it rotates in the counter clockwise direction from the position of drawing 1, the nail 25 of the ratchet 20 will \*\*\* the cam surface 10A of the latch cam 10. When in slide contact, the ratchet 20 resists the elastic force of the 2nd spring 22, and is rotated to clockwise direction. And if the latch cam 10 rotates counterclockwise and the nail 25 of the ratchet 20 arrives at the crevice 13 of the latch cam 10, this nail 25 will trespass upon this crevice 13, and will engage with the engagement face 15. Drawing 2 shows this engagement state, if it will be in this engagement state, a door will be in the state where it was closed, and there is no rotation of the latch cam 10 of the counter clockwise direction beyond it by the striker 12. In this engagement state, that stopper piece 24 engages with the 2nd stopper 24, and, as for the ratchet 20, rotation of the counter clockwise direction beyond it is regulated. That is, a door will be in the state which can be opened.

[0018]This engagement state is not released, if the ratchet 20 resists the elastic force of the 2nd spring 22 to the position in which the nail 25 of the ratchet 20 secedes from the engagement face 15 and it does not rotate to clockwise direction. If this engagement state is released, the latch cam 10 will be rotated to clockwise direction according to the elastic force of the 1st spring 16. Therefore, even if the ratchet 20 rotates in the counter clockwise direction again, the nail 25 does not return to an engagement state again in contact with the cam surface 10A.

[0019]As for said ratchet 22, in drawing 1, formed protruding of the lock pin 26 is carried out to the center-section back in back. Clockwise direction is made to rotate this ratchet 22 in this lock pin 26, namely, the locking mechanism which releases said engagement state engages with it.

[0020]Drawing 3 shows the locking mechanism allocated by the back of the ratchet mechanism. As for the direct-current motor 31, the worm gear 32A was formed in the output shaft 32, and the worm gear 33 has geared on the gear 32A. Therefore, if the direct-current motor 31 rotates, the worm gear 33 which has geared with the worm gear 32A will rotate in the counter clockwise direction in drawing 3.

[0021]Formed protruding of the driving cam 34 is carried out to the transverse plane of the worm gear 33, i.e., the field by the side of the ratchet 20, and it is in it. The driving cam 34 is a cam radially prolonged from the center of rotation of the worm gear 33, and if the worm gear 33 rotates, it will rotate similarly the tip part 34A of the driving cam 34 in the counter clockwise direction centering on the axis of rotation. One revolution of the worm gear 33 will stop said direct-current motor 31.

[0022]As for the driving cam 34, the tip part 34A engages with the lock pin 26 of said ratchet 20. That is, the lock pin 26 is arranged on the rotation locus of the driving cam 34 rotated with rotation of the worm gear 33. Therefore, when the driving cam 34 rotates in the counter clockwise direction, in drawing 2, from the upper part, the tip part 34A of the driving cam 34 faces to the lock pin 26 caudad, contacts it, and engages with it. If the driving cam 34 rotates

further, the ratchet 20 will be rotated to clockwise direction in drawing 2 via the lock pin 26. Based on rotation of this ratchet 20, an engagement state with said latch cam 10 is released. If the driving cam 34 furthermore rotates, engagement to the tip part 34A of this driving cam 34 and the lock pin 36 will be solved. If engagement is solved, the ratchet 20 will carry out a rotation return according to the elastic force of the 2nd spring 22. On the other hand, the driving cam 34 by which engagement was solved reaches and stops to the original rotation starting position.

[0023]Therefore, the engagement state of the latch cam 10 and the ratchet 20 will be released unless the driving cam 34 rotates. In this embodiment, the stop position (rotation starting position) of the driving cam 34 is set up become just before the tip part 34A of the driving cam 34 faces to the lock pin 26 caudad and contacts it from the upper part in drawing 2.

[0024]Drawing 5 shows the control circuit which carries out drive controlling of said direct-current motor 31. Lock switch SWof \*\* 1st1 as a lock switch and an unlocking switch is the switch built in the key cylinder provided in the position which adjoined the handle of the outside of a door. And if the key of a car is rotated to one way (lock direction), the 1st moving terminal S of lock switch SW1 will be connected to the lock side edge child L. If a key is rotated for another side (the unlocking direction), the 1st moving terminal S of lock switch SW1 will be connected to the unlocking side edge child U. If a key is extracted from a key cylinder, the 1st moving terminal S of lock switch SW1 will be in the state where it is not connected with the lock side edge child L and the unlocking side edge child U.

[0025]Lock switch SWof \*\* 2nd2 as a lock switch and an unlocking switch is the switch formed inside the door. And press of the final controlling element end (lock side) of the switch SW2 will connect the 2nd moving terminal S of lock switch SW2 to the lock side edge child L. Press of the final controlling element other end (the unlocking direction) of the switch SW2 will connect the 2nd moving terminal S of lock switch SW2 to the unlocking side edge child U. When not operating the final controlling element of switch SW2, the 2nd moving terminal S of lock switch SW2 will be in the state where it is not connected with the lock side edge child L and the unlocking side edge child U.

[0026]When lock switch SWof \*\* 3rd3 as a lock switch detects more than the speed that the vehicle speed sensor defined beforehand, the moving terminal S is connected to the lock side edge child L. lock switch SWof \*\* 3rd3 --- the account of before an end --- connectionless will be carried out, after reaching more than the speed defined beforehand and connecting the moving terminal S to the lock side edge child L.

[0027]The moving terminal S of the 1st - the 3rd lock switch SW1-SW3 is grounded. On the other hand, the lock side edge child L of each lock switches SW1-SW3 is connected to the controlling circuit part 40. Therefore, if the moving terminal S of the 1st - the 3rd lock switch SW1-SW3 is connected to the lock side edge child L, the lock side edge child's L potential will turn into earth potentials, and the ground voltage will be impressed to the controlling circuit part 40, respectively. Similarly the unlocking side edge child U of each lock switches SW1-SW3 is connected to the controlling circuit part 40. Therefore, if the moving terminal S of the 1st - the 3rd lock switch SW1-SW3 is connected to the unlocking side edge child U, the unlocking side edge child's U potential will turn into earth potentials, and the ground voltage will be impressed to the controlling circuit part 40, respectively.

[0028]The 1st door opening switch SW4 is a switch which is interlocked with the handle for door opening close provided in the outside of the door, and is opened and closed. If a handle is pulled up in order to open a door, the moving terminal S of the switch SW4 will be connected to the point of contact a. And if a handle is detached, the moving terminal S of the switch SW4 will serve as the point of contact a and connectionless.

[0029]The 2nd door opening switch SW5 is a switch which is interlocked with the handle for door opening close provided inside the door, and is opened and closed. If a handle is lengthened in order to open a door, the moving terminal S of the switch SW5 will be connected to the point of contact a. And if this handle is detached, the moving terminal S of the switch SW5 will serve as the point of contact a and connectionless.

[0030]The moving terminal S of the 1st and the 2nd door opening switch SW4, and SW5 is

connected to the positive electrode of the battery carried in the car. On the other hand, the point of contact a of each door opening switch SW4 and SW5 is connected to the controlling circuit part 40. Therefore, if the moving terminal S of the 1st and the 2nd door opening switch SW4, and SW5 is connected to the point of contact a, plus power supply VB of a battery will be outputted to the controlling circuit part 40.

[0031]Said controlling circuit part 40 comprises the ratching relay 41. The ratching relay 41 comprises the 1st exiting coil 42, 2nd exiting coil 43, and moving terminal S. As for the 1st exiting coil 42, the end is connected to the positive electrode of said battery via the common input terminal 44. The other end of the 1st exiting coil 42 is connected to the unlocking side edge child U of said 1st and 2nd lock switch SW1 and SW2 via the input terminal 45. Therefore, if the moving terminal S of the 1st and 2nd lock switch SW1 and SW2 is connected to the unlocking side edge child U, positive voltage VB of a battery will be impressed and the 1st exiting coil 42 will be magnetized.

[0032]As for the 2nd exiting coil 43, the end is connected to the positive electrode of said battery via said common input terminal 44. The other end of the 2nd exiting coil 43 is connected to the lock side edge child L of said 1st [ the ] - the 3rd lock switch SW1-SW3 via the input terminal 46. Therefore, if the moving terminal S of 1 - the 3rd lock switch SW1-SW3 is connected to the lock side edge child L, positive voltage VB of a battery will be impressed and the 2nd exiting coil 43 will be magnetized.

[0033]It is connected to the point of contact A based on magnetization of said 1st exiting coil 42, and even if magnetization of this coil 42 disappears, unless the 2nd exiting coil 43 is magnetized, the moving terminal S of the ratching relay 41 is constituted so that the state where it was connected to the point of contact A may be held. It is connected to the point of contact B based on magnetization of said 2nd exiting coil 43, and even if magnetization of this coil 43 disappears, unless the 1st exiting coil 42 is magnetized, the moving terminal S of the ratching relay 41 is constituted so that the state where it was connected to the point of contact B may be held.

[0034]Said point of contact A is connected to the point of contact a of the 1st and the 2nd door opening switch SW4, and SW5 via the input terminal 47. Said point of contact B is connected to the input terminal 48, and the input terminal 48 is in the state which floated where it is not connected at all. The moving terminal S of said ratching relay 41 is connected to the direct-current motor 31 via the output terminal 49. Therefore, where the moving terminal S of the ratching relay 41 is connected to the point of contact A, when ON operation (the moving terminal S connects with the point of contact a) of the 1st and the 2nd door opening switch SW4, and SW5 is carried out, positive voltage VB of a battery will be impressed and the direct-current motor 31 will be driven.

[0035]Position detecting switch SW7 is provided between said direct-current motor 31 and the positive electrode of a battery. This position detecting switch SW7 is allocated by the direct-current motor 31 as shown in drawing 3. When said worm gear 33 is in said rotation starting position, and the moving terminal S serves as the point of contact C and connectionless and there is nothing to a rotation starting position, the moving terminal S connects position detecting switch SW7 of 33 worm gear to the point of contact C. That is, position detecting switch SW7 rotated based on rotation of the direct-current motor 31, and when said worm gear 33 rotates one time and arrives at a rotation starting position, it is provided with the operating member 50 which makes the moving terminal S estrange from the point of contact C.

[0036]Compulsive door opening switch SW6 is connected to said direct-current motor 31. Compulsive door opening switch SW6 is the switch formed in the instrument panel of the driver's seat, the moving terminal S is connected to the positive electrode of a battery via an ignition key switch, and the point of contact d is connected to the direct-current motor 31.

[0037]Next, an operation of the door lock device constituted as mentioned above is explained. Now, if a door is shut, the latch cam 10 will be rotated in the counter clockwise direction in drawing 1 by the striker 12. And if it rotates to the position which the latch cam 10 shows to drawing 2, the nail 25 of the ratchet 20 will engage with the engagement face 15 of a latch cam. Therefore, it is not released, if the ratchet 20 resists the elastic force of the 2nd spring 22 to

the position in which the nail 25 secedes from the engagement face 15 and it does not rotate to clockwise direction. In this state, position detecting switch SW7 is in an OFF state, and the worm gear 33 is in a rotation starting position.

[0038]If any one of the 1st and 2nd lock switch SW1 and the SW2 is operated to a lock direction at this time, the moving terminal S of that switch will be connected with the lock side edge child L. The 2nd exiting coil 43 of the ratching relay 41 is magnetized by this. It is connected to the point of contact B by magnetization of this 2nd exiting coil 43, and the moving terminal S of the ratching relay 41 is held.

[0039]And in this state, since the moving terminal S and the point of contact A of the ratching relay 41 are not connected even if it carries out ON operation of SWthe 1st [ or ], the 2nd door opening switch SW4, or 5, positive voltage VB of a battery is not impressed and the direct-current motor 31 is not driven. That is, the door is a locked position. When it becomes more than the speed which the vehicle speed defined beforehand and the 3rd moving terminal S of lock switch SW3 is connected to the lock side edge child L, it will be in a locked position similarly.

[0040]If any one of the 1st and 2nd lock switch SW1 and the SW2 is operated in the unlocking direction that this locked position should be canceled, the moving terminal S of that switch will be connected with the unlocking side edge child U. The 1st exiting coil 42 of the ratching relay 41 is magnetized by this. The moving terminal S of the ratching relay 41 will be connected to the point of contact A by magnetization of this 1st exiting coil 42, and maintenance, i.e., a door, will be in an unlock condition.

[0041]And in this unlock condition, if ON operation of SWthe 1st [ or ], the 2nd door opening switch SW4, or 5 is carried out, positive voltage VB of a battery will be impressed to the direct-current motor 31 via the moving terminal S of the ratching relay 41. The drive start of the direct-current motor 31 is carried out, and it rotates the worm gear 33. The driving cam 34 is also rotated with rotation of the worm gear 33, and it is made to rotate to the position which engages with the lock pin 26 promptly and shows drawing 2 the ratchet 20 according to a two-dot chain line.

[0042]Since position detecting switch SW7 is turned on from OFF even if the 1st or the 2nd door opening switch SW4, and SW5 are turned off in the middle of this rotation, driving it is continued until the worm gear 33 turns the direct-current motor 31 and it reaches to a rotation starting position.

[0043]If the ratchet 20 rotates to the position of a two-dot chain line, the engagement state (latch condition) will be released and the latch cam 10 will be in the Anh latch condition. As a result, if a handle etc. are lengthened as it is, a door can be opened easily.

[0044]And if the worm gear 33 reaches to a rotation starting position, position detecting switch SW7 will turn off and the direct-current motor 31 will stop. In a locked position, if ON operation of compulsive door opening switch SW6 is carried out, the direct-current motor 31 is driven and can make a door the Anh latch condition compulsorily.

[0045]Next, the feature of the above-mentioned embodiment is indicated below.

(1) According to this embodiment, the connection lever which transmits the operating physical force based on operation of the handle of a door to a ratchet like before is not provided. Latch ANRATCHI and lock unlocking were made to perform by the driving cam 34 provided in the worm gear 33 rotated with the direct-current motor 31 as the substitute. Therefore, the complicated link mechanism established between a conventional connection lever, its connection lever, and ratchet becomes unnecessary. As a result, while part mark of the part decrease, a miniaturization can be attained, and moreover, cost reduction can be planned.

[0046](2) According to this embodiment, a locked position is not released unless the direct-current motor 31 is rotated at least. Therefore, a thin plate can be inserted from the crevice between door glass like before, said link mechanism can be operated, and a locked position cannot be made to cancel unlawfully, but theft prevention can be aimed at in this embodiment.

[0047](3) According to this embodiment, a locked position cuts and changes to an unlock condition by rotation of the direct-current motor 31. Therefore, the unpleasant operating sound of the link mechanism generated when operating said link mechanism between a locked position and an unlocked position like before is not generated.

[0048](4) At this embodiment, it is carrying out only by the drive of the direct-current motor 31 without rotating the ratchet 20 based on routine, such as a connection lever. And the drive of the direct-current motor 31 is performed based on the electrical signal only by operation of each switches SW1-SW7, i.e., a switch. Therefore, even if various conditions which carry out drive controlling of the direct-current motor 31 using switches other than the above-mentioned each switch SW1 - SW7, etc. are added and it newly makes the state of lock unlocking and latch ANRATCHI, design correspondence can be carried out easily. For example, it is made for an air bag's operation point of contact to be interlocked with, and it can also perform easily that an air bag makes a door the Anh latch condition after after-operation fixed time lapse only by adding electric constitution, without adding mechanical constitution.

[0049](A 2nd embodiment) As for other composition, it is the same that the composition of the controlling circuit part 40 which described this embodiment by a 1st embodiment is only different. Therefore, only the controlling circuit part 40 from which explanation is expedient-upper-different is explained.

[0050]In drawing 6, the controlling circuit part 40 comprises the enhancement type P channel MOS transistor (it is called a PMOS transistor) T1, PNP transistor T2, NPN transistor T3, and three resistance R1-R3.

[0051]As for PMOS transistor T1, the gate is connected to the unlocking side edge child U of the 1st and 2nd lock switch SW1 and SW2. The drain of PMOS transistor T1 is connected to the point of contact a of said 1st [ the ] and the 2nd door opening switch SW4, and SW5, and the source is connected to the direct-current motor 31.

[0052]The base of PNP transistor T2 is connected to the gate of PMOS transistor T1 via the resistance R2. The collector of PNP transistor T2 is connected to the lock side edge child L of said 1st [ the ] - the 3rd lock switch SW1-SW3, and, as for the emitter, positive voltage VB of said battery is impressed.

[0053]The collector of PNP transistor T2 is connected to the base of NPN transistor T3 via the resistance R3. Positive voltage VB of said battery is impressed via the resistance R1 to the collector of NPN transistor T3, and the emitter is grounded. The node of the resistance R2 and the resistance R1 is connected to the gate of said PMOS transistor T1.

[0054]Therefore, if any one of the 1st and 2nd lock switch SW1 and the SW2 is operated to a lock direction, the moving terminal S of the switch will be connected with the lock side edge child L, and the lock side edge child L will be grounded. Therefore, each transistor T1 - T3 will be in an OFF state. Since NPN transistor T3 turns off at this time, positive voltage VB is impressed to that gate, and PMOS transistor T1 holds the OFF state.

[0055]And in this state, even if it carries out ON operation of SWthe 1st [ or ], the 2nd door opening switch SW4, or 5, since PMOS transistor T1 is in an OFF state, positive voltage VB of a battery is not impressed and the direct-current motor 31 is not driven. That is, the door is a locked position.

[0056]If any one of the 1st and 2nd lock switch SW1 and the SW2 is operated in the unlocking direction that this locked position should be canceled, the moving terminal S of that switch will be connected with the unlocking side edge child U. By this, it will become the potential with which the unlocking side edge child U was grounded, and PMOS transistor T1 will be in an ON state. By one of this PMOS transistor T1, a door will be in an unlock condition.

[0057]In this unlock condition, even if said 1st and 2nd lock switch SW1 and SW2 are canceled, PMOS transistor T1 holds an ON state. That is, one [ one / of PMOS transistor T1 / PNP transistor T2 ]. One [ one of this PNP transistor T2 is answered, and / NPN transistor T3 ]. As a result, the potential concerning the gate of PMOS transistor T1 falls, and even if said moving terminal S estranges from the unlocking side edge child U, the state, one [ PMOS transistor T1 ], is held.

[0058]And in this unlock condition, if ON operation of SWthe 1st [ or ], the 2nd door opening switch SW4, or 5 is carried out, positive voltage VB of a battery will be impressed to the direct-current motor 31 via PMOS transistor T1. The drive start of the direct-current motor 31 is carried out, and it rotates the worm gear 33. The driving cam 34 is also rotated with rotation of the worm gear 33, and it is made to rotate to the position which engages with the lock pin 26

promptly and shows drawing 2 the ratchet 20 according to a two-dot chain line.

[0059]Since position detecting switch SW7 is turned on from OFF even if the 1st or the 2nd door opening switch SW4, and SW5 are turned off in the middle of this rotation, driving it is continued until the worm gear 33 turns the direct-current motor 31 and it reaches to a rotation starting position.

[0060]If the ratchet 20 rotates to the position of a two-dot chain line, the engagement state (latch condition) will be released and the latch cam 10 will be in the Anh latch condition. As a result, if a handle etc. are lengthened as it is, a door can be opened easily.

[0061]Therefore, it has the same operation effect as a 1st embodiment described above also in this embodiment.

(A 3rd embodiment) This embodiment is described according to drawing 7. Only the portion of explanation which is different from a 1st embodiment for convenience is explained.

[0062]In drawing 7, the moving terminal S of the 1st ~ the 3rd lock switch SW1~SW3 is connected to the positive electrode of a battery, and positive voltage VB is impressed. the [ the 1st ~ ] — the lock side edge child L of three is connected to the controlling circuit part 40 via the diodes D1~D3, respectively. The unlocking side edge child U of the 1st and 2nd lock switch SW1 and SW2 is connected to the controlling circuit part 40 via the diode D4 and D5, respectively.

[0063]On the other hand, the moving terminal S of the 1st and the 2nd door opening switch SW4, and SW5 is connected to said direct-current motor 31. The point of contact a of the 1st and the 2nd door opening switch SW4, and SW5 is connected to the controlling circuit part 40.

[0064]Next, the controlling circuit part 40 is explained. The controlling circuit part 40 comprises the resistance R4~R6 of 51 or 3 relays which consist of PNP transistor T4, the exiting coil RY, and the relay contact RB, the capacitor 52, and the zener diode 53.

[0065]The base of said PNP transistor T4 is connected with the lock side edge child L of said 1st [ the ] ~ the 3rd lock switch SW1~SW3 while it is grounded via the resistance R4 and R5. The collector of PNP transistor T4 is grounded via the resistance R6 and the exiting coil RY while being connected with the unlocking side edge child U of the 1st and 2nd lock switch SW1 and SW2. The emitter of PNP transistor T4 is connected to the positive electrode of said battery via the relay contact RB while being connected with the point of contact a of said 1st [ the ] and the 2nd door opening switch SW4, and SW5.

[0066]The capacitor 52 is connected to said resistance R5 in parallel. The node of the resistance R6 and the exiting coil RY is grounded via the zener diode 53. Therefore, if SW either the 1st and 2nd lock switch SW1 or 2 is operated in the unlocking direction and the moving terminal S is connected to the unlocking side edge child U, the exiting coil RY will be magnetized and the relay contact RB will close it. As a result, positive voltage VB of a battery will be impressed to the point of contact a of the 1st and the 2nd door opening switch SW4, and SW5, and will be in an unlock condition. At this time, positive voltage VB is impressed also to the emitter of the transistor T4, and energizing said exiting coil RY is continued. That is, self-hold of the relay 51 is carried out. The charging time of said capacitor 52 decides on the time of this self-hold. If ON operation of SW the 1st [ or ], the 2nd door opening switch SW4, or 5 is carried out during this time by which self-hold is carried out, positive voltage VB will be impressed and the direct-current motor 31 will start a drive. Therefore, a door will be in the Anh latch condition.

[0067]On the other hand, if the moving terminal S of either the 1st ~ the 3rd lock switch SW1~SW3 is connected to the lock side edge child L, since positive voltage VB is impressed to the base, PNP transistor T4 will be turned off. As a result, self-hold will be canceled promptly and the relay 51 in a self-hold state will be from an unlock condition in a locked position.

[0068]In the state where the 1st ~ the 3rd lock switch SW1~SW3 are not operated, since the exiting coil RY is not energized but the relay contact RB is carrying out the open circuit, it will be held at the locked position.

[0069]Therefore, also in this embodiment, it has the same operation effect as said 1st embodiment.

(A 4th embodiment) This embodiment is described according to drawing 8. Only the portion of

explanation which is different from a 1st embodiment for convenience is explained. 1st OR circuit 61 inputs the door unlocking signal of positive voltage VB, when said 1st and 2nd lock switch SW1 and SW2 are operated in the unlocking direction. 1st OR circuit 61 outputs the door-lock signal to the controlling circuit part 40. 2nd OR circuit 62 inputs the door-lock signal of positive voltage VB, when said 1st [ the ] - the 3rd lock switch SW1-SW3 are operated to a lock direction. 2nd OR circuit 62 outputs the door unlocking signal to the controlling circuit part 40. [0070]The controlling circuit part 40 consists of the flip-flop circuit 63 which consists of two OR circuits 63a and 63b. And if a door unlocking signal is inputted from said 1st OR circuit 61, the signal (unlocking signal) of high potential "logical-value "1"" will output the flip-flop circuit 63 to AND circuit 64 of the next step, and it will hold the state. If a door-lock signal is inputted from said 2nd OR circuit 62, the signal (lock signal) of low voltage "logical-value "0"" will output the flip-flop circuit 63 to AND circuit 64 of the next step, and it will hold the state.

[0071]3rd OR circuit 65 inputs the door opening signal of positive voltage VB, when ON operation of said 1st [ the ] and the 2nd door opening switch SW4, and SW5 is carried out. 3rd OR circuit 65 answers the door opening signal, and outputs the opening signal of high potential "logical-value "1"" to said AND circuit 64. In AND circuit 64, the output terminal is connected to the power switch 67 via 4th OR circuit 66. That is, if an opening signal is outputted from 3rd OR circuit 65 when the unlocking signal is outputted from the flip-flop 63, the opening signal will be supplied to the power switch 67 via AND circuit 64 and 4th OR circuit 66. When the lock signal is outputted from the flip-flop 63, even if an opening signal is outputted from 3rd OR circuit 65, the opening signal is prevented in AND circuit 64, and is not supplied to the power switch 67.

[0072]4th OR circuit 66 inputs positive voltage VB via said position detecting switch SW7. That is, when position detecting switch SW7 is in an ON state, said positive voltage VB is supplied to the power switch 67 via 4th OR circuit 66 as the 2nd opening signal.

[0073]If said power switch 67 inputs said opening signal or the 2nd opening signal, ON operation of it will be carried out and it will impress positive voltage VB of a battery to said direct-current motor 31. On the contrary, when not having inputted said opening signal and the 2nd opening signal, the power switch 67 intercepts supply of positive voltage VB to the direct-current motor 31.

[0074]Therefore, when a door unlocking signal is inputted into the flip-flop 63, an unlocking signal will be inputted into AND circuit 64 from the flip-flop 63. As a result, if it will be in an unlock condition and an opening signal is inputted from 3rd OR circuit 65, the direct-current motor 31 will be in the state which it drives, and rotation control is carried out like each embodiment besides the above, and can open a door.

[0075]When a door-lock signal is inputted into the flip-flop 63, a lock signal will be inputted into AND circuit 64 from the flip-flop 63. As a result, even if it will be in a locked position and an opening signal is inputted from 3rd OR circuit 65, the direct-current motor 31 will be in the state where it does not drive but a door can be opened, like an embodiment besides the above.

[0076]Thus, also in this embodiment, it has the same operation effect as said 1st embodiment. This invention is not limited to each above-mentioned embodiment, and may be carried out in the following modes.

[0077](1) Although the direct-current motor 31 constituted the actuator from said embodiment, it may replace with the electromagnetism solenoid 70 shown in drawing 9, and may carry out. In this case, since the electromagnetism solenoid 70 makes it rotate directly, the gear 32, the worm gear 33, and driving cam 34 grade become unnecessary. It may replace with the direct-current motor 31, and may carry out by other motors, such as a step motor. Of course, an actuator is carried out, and electrically, drive controlling may carry it out, as oil pressure or an air cylinder is carried out.

[0078](2) Although the driving cam 34 was rotated via the form wheel 33 in said example, it may be made to rotate the driving cam 34 with a direct-output axis.

(3) Although said 1st and 2nd lock switch SW1 and SW2 were the switches which can set up two states, a locked position and an unlock condition, this may be divided into the switch for a lock, and the switch for unlocking, and they may carry it out.

[0079]

[Effect of the Invention]According to this invention, as explained in full detail above, structure of a door lock device can be simplified, and while being able to aim at reduction of part mark, moreover, it has the outstanding effect which a miniaturization can plan.

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[Translation done.]

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**TECHNICAL FIELD**

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[Field of the Invention]This invention relates to a door lock device.

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[Translation done.]

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**PRIOR ART**

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[Description of the Prior Art]Generally, the door for cars is equipped with the ratchet mechanism and the locking mechanism, for example so that clearly from JP,7-122367,B etc. When a door is shut, a ratchet mechanism is a mechanism in which the state where it was closed is held, unless the handle for open provided inside outside the door is operated. Even if a locking mechanism operates the handle for open [ said ], it is a mechanism in which a door is held in the closed state.

[0003]When a door is shut, a ratchet mechanism rotates the latch cam which the striker provided in the body side provided in the door side, and makes the striker and a latch cam engaged. the ratchet which provided the latch cam in the door side at this time --- being engaged --- it becomes rotation impossible and it becomes impossible to change a rotation return into the original state As a result, a door will be in the closed state and what is called a latch condition. And this latch condition is canceled by operating a handle. That is, the connection lever connected between the handle and said ratchet transmits an operating physical force on a knob to RACHETCHI, and rotates a ratchet. As a result, a latch cam will be released by the rotation and the ratchet of a door will be in the Anh latch condition.

[0004]On the other hand, the locking mechanism is constituted by the electric actuator which is provided between the connection lever and ratchet of said ratchet mechanism, and operates a link and this link. This link is arranged at the state of two positions of a locked position where a ratchet is not rotated, even if the unlocked position and connection lever which are changed into the state of rotating a ratchet in said connection lever operate. And two positions of this link are performed in an electric actuator. That is, if a link is fixed to a locked position in an electric actuator, even if a connection lever tends to rotate a ratchet by operation on a knob, the transmission force will not be transmitted to a ratchet by the link in said lock 1, and the ratchet will not be rotated. As a result, the door which is in a latch condition according to a ratchet mechanism serves as as [ locked position ], unless a link returns to an unlocked position in said electric actuator.

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**EFFECT OF THE INVENTION**

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[Effect of the Invention]According to this invention, as explained in full detail above, structure of a door lock device can be simplified, and while being able to aim at reduction of part mark, moreover, it has the outstanding effect which a miniaturization can plan.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] By the way, said locking mechanism comprises an electric actuator which is provided between the connection lever and ratchet of said ratchet mechanism, and operates a link and this link. Since it was a mechanism for changing this link into a non-locked position and a locked position by being arranged in an unlocked position and a locked position, that structure was complicated. The locking mechanism had many the Wakebe article mark, was large-sized, and had become a high cost.

[0006] While this invention is made in order to cancel the above-mentioned problem, and the purpose can simplify the structure and being able to aim at reduction of part mark, it is in providing the door lock device which can attain a miniaturization.

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**MEANS**

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[Means for Solving the Problem]A latch cam which an invention of claim 1 fits in a striker, and resists elastic force of the 1st elastic member and is rotated in the striker. A ratchet mechanism which consists of a ratchet which rotates according to elastic force of the 2nd elastic member, is engaged to an engagement part formed in the latch cam, prevents rotation of a counter direction of the latch cam, and prevents secession of said striker when the latch cam to rotate rotates to a prescribed position defined beforehand. Let a door lock device which consists of an actuator which engages with a ratchet of said ratchet mechanism, resists elastic force of said 2nd elastic member, and makes a counter direction rotate the ratchet, and of which engagement to said latch cam is made to cancel be the gist.

[0008]A latch cam which an invention of claim 2 fits in a striker, and resists elastic force of the 1st elastic member and is rotated in the striker. A ratchet mechanism which consists of a ratchet which rotates according to elastic force of the 2nd elastic member, is engaged to an engagement part formed in the latch cam, prevents rotation of a counter direction of the latch cam, and prevents secession of said striker when the latch cam to rotate rotates to a prescribed position defined beforehand. An actuator which engages with a ratchet of said ratchet mechanism, resists elastic force of said 2nd elastic member, and makes a counter direction rotate the ratchet and of which engagement to said latch cam is made to cancel. A door opening switch for making said actuator drive and making a counter direction rotate said ratchet. A lock switch for making a drive of said actuator impossible, and an unlocking switch for enabling a drive of said actuator. Let a door lock device which consists operation of said door opening switch of a controlling circuit part which validates operation of said door opening switch based on operation of said unlocking switch invalid be the gist based on operation of said lock switch.

[0009]An invention of claim 3 consists of a driving cam which said actuator rotates [ driving cam ] with rotation of a direct-current motor and its direct-current motor, and makes a counter direction rotate said ratchet in the door lock device according to claim 1 or 2.

[0010]According to the invention of claim 1, when a latch cam and a ratchet are in an engagement state, unless an actuator makes a counter direction rotate the ratchet, the engagement state is not canceled.

[0011]A controlling circuit part will not make an actuator according to the invention of claim 2, drive, when a lock switch is operated, even if a door opening switch is operated. A controlling circuit part makes an actuator drive promptly, when an unlocking switch is operated, when a door opening switch is operated.

[0012]According to the invention of claim 3, when a direct-current motor rotates, a driving cam also rotates, a ratchet engages with the driving cam to rotate, and it rotates to a counter direction.

[0013]

[Embodiment of the Invention]

(A 1st embodiment) The 1 embodiment which materialized this invention to the door lock device adopted as the door for cars hereafter is described according to a drawing. An important section front view for drawing 1 to explain the ratchet mechanism built in the door of the side of a driver's seat and drawing 2 are the important section front views showing the latch condition of a

ratchet mechanism similarly. Drawing 3 is an important section front view showing the locking mechanism allocated by the back of the ratchet mechanism shown in drawing 1.

[0014]In drawing 1, the latch cam 10 is allocated by the substrate allocated inside the frame of a door side face, and is supported rotatable focusing on the axis 11. The crevice 13 which the U-shaped striker 12 which formed the latch cam 10 in the frame of the vehicle body invades, and is engaged is formed. In drawing 1, an upper part opening forms up the shape of slant 14. i.e., the cutout surface cut and lacked so that it might be extended. and, as for the crevice 13, forms the passage passage of the striker 12. The field of the opposite hand of the cutout surface 14 of the crevice 13 is made into the engagement face 15 as an engagement part, in drawing 1 [ as opposed to / the striker 12 which trespasses upon the crevice 13 contacts, and / the latch cam 10 of the striker 12 ] --- rightward relative displacement --- the latch cam 10 is both rotated in the counter clockwise direction in drawing 1.

[0015]As for the latch cam 10, elastic force is given to clockwise direction in drawing 1 by the 1st spring 16 as the 1st elastic member. The 1st stopper 17 is allocated on the rotation orbit of the latch cam 10, it engages with the stopper surface 18 formed in the latch cam 10, and rotation of the latch cam 10 of the clockwise direction beyond it is regulated. The rotating position of the latch cam 10 which is shown in drawing 1 and by which rotation regulation was carried out is a position which permits that said striker 12 passes the lower part of the cutout surface 14 toward said engagement face 15, when the cutout surface 14 of said crevice 13 is in a horizontal state and a door is shut.

[0016]The ratchet 20 is allocated in said latch cam 10 bottom, and the ratchet 20 is supported rotatable focusing on the axis 21. As for the ratchet 20, in drawing 1, elastic force is given in the counter clockwise direction by the 2nd spring 22 as the 2nd elastic member. The 2nd stopper 23 is allocated on the rotation orbit of the ratchet 20, it engages with the stopper piece 24 formed at the tip of the ratchet 20, and rotation of the ratchet 20 of the counter clockwise direction beyond it is regulated.

[0017]The nail 25 is formed in the tip part latch cam side of the ratchet 20. The nail 25 contacts the cam surface 10A formed in the peripheral face of the latch cam 10 according to the elastic force of said 2nd spring 22. Therefore, if said latch cam 10 resists the elastic force of the 1st spring 16 and it rotates in the counter clockwise direction from the position of drawing 1, the nail 25 of the ratchet 20 will \*\*\*\* the cam surface 10A of the latch cam 10. When in slide contact, the ratchet 20 resists the elastic force of the 2nd spring 22, and is rotated to clockwise direction. And if the latch cam 10 rotates counterclockwise and the nail 25 of the ratchet 20 arrives at the crevice 13 of the latch cam 10, this nail 25 will trespass upon this crevice 13, and will engage with the engagement face 15. Drawing 2 shows this engagement state, if it will be in this engagement state, a door will be in the state where it was closed, and there is no rotation of the latch cam 10 of the counter clockwise direction beyond it by the striker 12. In this engagement state, that stopper piece 24 engages with the 2nd stopper 24, and, as for the ratchet 20, rotation of the counter clockwise direction beyond it is regulated. That is, a door will be in the state which can be opened.

[0018]This engagement state is not released, if the ratchet 20 resists the elastic force of the 2nd spring 22 to the position in which the nail 25 of the ratchet 20 secedes from the engagement face 15 and it does not rotate to clockwise direction. If this engagement state is released, the latch cam 10 will be rotated to clockwise direction according to the elastic force of the 1st spring 16. Therefore, even if the ratchet 20 rotates in the counter clockwise direction again, the nail 25 does not return to an engagement state again in contact with the cam surface 10A.

[0019]As for said ratchet 22, in drawing 1, formed protruding of the lock pin 26 is carried out to the center-section back in back. Clockwise direction is made to rotate this ratchet 22 in this lock pin 26, namely, the locking mechanism which releases said engagement state engages with it.

[0020]Drawing 3 shows the locking mechanism allocated by the back of the ratchet mechanism. As for the direct-current motor 31, the worm gear 32A was formed in the output shaft 32, and the worm gear 33 has geared on the gear 32A. Therefore, if the direct-current motor 31 rotates,

the worm gear 33 which has geared with the worm gear 32A will rotate in the counter clockwise direction in drawing 3.

[0021] Formed protruding of the driving cam 34 is carried out to the transverse plane of the worm gear 33, i.e., the field by the side of the ratchet 20, and it is in it. The driving cam 34 is a cam radially prolonged from the center of rotation of the worm gear 33, and if the worm gear 33 rotates, it will rotate similarly the tip part 34A of the driving cam 34 in the counter clockwise direction centering on the axis of rotation. One revolution of the worm gear 33 will stop said direct-current motor 31.

[0022] As for the driving cam 34, the tip part 34A engages with the lock pin 26 of said ratchet 20. That is, the lock pin 26 is arranged on the rotation locus of the driving cam 34 rotated with rotation of the worm gear 33. Therefore, when the driving cam 34 rotates in the counter clockwise direction, in drawing 2, from the upper part, the tip part 34A of the driving cam 34 faces to the lock pin 26 caudad, contacts it, and engages with it. If the driving cam 34 rotates further, the ratchet 20 will be rotated to clockwise direction in drawing 2 via the lock pin 26. Based on rotation of this ratchet 20, an engagement state with said latch cam 10 is released. If the driving cam 34 furthermore rotates, engagement to the tip part 34A of this driving cam 34 and the lock pin 36 will be solved. If engagement is solved, the ratchet 20 will carry out a rotation return according to the elastic force of the 2nd spring 22. On the other hand, the driving cam 34 by which engagement was solved reaches and stops to the original rotation starting position.

[0023] Therefore, the engagement state of the latch cam 10 and the ratchet 20 will be released unless the driving cam 34 rotates. In this embodiment, the stop position (rotation starting position) of the driving cam 34 is set up become just before the tip part 34A of the driving cam 34 faces to the lock pin 26 caudad and contacts it from the upper part in drawing 2.

[0024] Drawing 5 shows the control circuit which carries out drive controlling of said direct-current motor 31. Lock switch SWof \*\* 1st1 as a lock switch and an unlocking switch is the switch built in the key cylinder provided in the position which adjoined the handle of the outside of a door. And if the key of a car is rotated to one way (lock direction), the 1st moving terminal S of lock switch SW1 will be connected to the lock side edge child L. If a key is rotated for another side (the unlocking direction), the 1st moving terminal S of lock switch SW1 will be connected to the unlocking side edge child U. If a key is extracted from a key cylinder, the 1st moving terminal S of lock switch SW1 will be in the state where it is not connected with the lock side edge child L and the unlocking side edge child U.

[0025] Lock switch SWof \*\* 2nd2 as a lock switch and an unlocking switch is the switch formed inside the door. And press of the final controlling element end (lock side) of the switch SW2 will connect the 2nd moving terminal S of lock switch SW2 to the lock side edge child L. Press of the final controlling element other end (the unlocking direction) of the switch SW2 will connect the 2nd moving terminal S of lock switch SW2 to the unlocking side edge child U. When not operating the final controlling element of switch SW2, the 2nd moving terminal S of lock switch SW2 will be in the state where it is not connected with the lock side edge child L and the unlocking side edge child U.

[0026] When lock switch SWof \*\* 3rd3 as a lock switch detects more than the speed that the vehicle speed sensor defined beforehand, the moving terminal S is connected to the lock side edge child L. lock switch SWof \*\* 3rd3 — the account of before an end — connectionless will be carried out, after reaching more than the speed defined beforehand and connecting the moving terminal S to the lock side edge child L.

[0027] The moving terminal S of the 1st – the 3rd lock switch SW1-SW3 is grounded. On the other hand, the lock side edge child L of each lock switches SW1-SW3 is connected to the controlling circuit part 40. Therefore, if the moving terminal S of the 1st – the 3rd lock switch SW1-SW3 is connected to the lock side edge child L, the lock side edge child's L potential will turn into earth potentials, and the ground voltage will be impressed to the controlling circuit part 40, respectively. Similarly the unlocking side edge child U of each lock switches SW1-SW3 is connected to the controlling circuit part 40. Therefore, if the moving terminal S of the 1st – the 3rd lock switch SW1-SW3 is connected to the unlocking side edge child U, the unlocking side

edge child's U potential will turn into earth potentials, and the ground voltage will be impressed to the controlling circuit part 40, respectively.

[0028]The 1st door opening switch SW4 is a switch which is interlocked with the handle for door opening close provided in the outside of the door, and is opened and closed. If a handle is pulled up in order to open a door, the moving terminal S of the switch SW4 will be connected to the point of contact a. And if a handle is detached, the moving terminal S of the switch SW4 will serve as the point of contact a and connectionless.

[0029]The 2nd door opening switch SW5 is a switch which is interlocked with the handle for door opening close provided inside the door, and is opened and closed. If a handle is lengthened in order to open a door, the moving terminal S of the switch SW5 will be connected to the point of contact a. And if this handle is detached, the moving terminal S of the switch SW5 will serve as the point of contact a and connectionless.

[0030]The moving terminal S of the 1st and the 2nd door opening switch SW4, and SW5 is connected to the positive electrode of the battery carried in the car. On the other hand, the point of contact a of each door opening switch SW4 and SW5 is connected to the controlling circuit part 40. Therefore, if the moving terminal S of the 1st and the 2nd door opening switch SW4, and SW5 is connected to the point of contact a, plus power supply VB of a battery will be outputted to the controlling circuit part 40.

[0031]Said controlling circuit part 40 comprises the ratching relay 41. The ratching relay 41 comprises the 1st exiting coil 42, 2nd exiting coil 43, and moving terminal S. As for the 1st exiting coil 42, the end is connected to the positive electrode of said battery via the common input terminal 44. The other end of the 1st exiting coil 42 is connected to the unlocking side edge child U of said 1st and 2nd lock switch SW1 and SW2 via the input terminal 45. Therefore, if the moving terminal S of the 1st and 2nd lock switch SW1 and SW2 is connected to the unlocking side edge child U, positive voltage VB of a battery will be impressed and the 1st exiting coil 42 will be magnetized.

[0032]As for the 2nd exiting coil 43, the end is connected to the positive electrode of said battery via said common input terminal 44. The other end of the 2nd exiting coil 43 is connected to the lock side edge child L of said 1st [ the ] - the 3rd lock switch SW1-SW3 via the input terminal 46. Therefore, if the moving terminal S of 1 - the 3rd lock switch SW1-SW3 is connected to the lock side edge child L, positive voltage VB of a battery will be impressed and the 2nd exiting coil 43 will be magnetized.

[0033]It is connected to the point of contact A based on magnetization of said 1st exiting coil 42, and even if magnetization of this coil 42 disappears, unless the 2nd exiting coil 43 is magnetized, the moving terminal S of the ratching relay 41 is constituted so that the state where it was connected to the point of contact A may be held. It is connected to the point of contact B based on magnetization of said 2nd exiting coil 43, and even if magnetization of this coil 43 disappears, unless the 1st exiting coil 42 is magnetized, the moving terminal S of the ratching relay 41 is constituted so that the state where it was connected to the point of contact B may be held.

[0034]Said point of contact A is connected to the point of contact a of the 1st and the 2nd door opening switch SW4, and SW5 via the input terminal 47. Said point of contact B is connected to the input terminal 48, and the input terminal 48 is in the state which floated where it is not connected at all. The moving terminal S of said ratching relay 41 is connected to the direct-current motor 31 via the output terminal 49. Therefore, where the moving terminal S of the ratching relay 41 is connected to the point of contact A, when ON operation (the moving terminal S connects with the point of contact a) of the 1st and the 2nd door opening switch SW4, and SW5 is carried out, positive voltage VB of a battery will be impressed and the direct-current motor 31 will be driven.

[0035]Position detecting switch SW7 is provided between said direct-current motor 31 and the positive electrode of a battery. This position detecting switch SW7 is allocated by the direct-current motor 31 as shown in drawing 3. When said worm gear 33 is in said rotation starting position, and the moving terminal S serves as the point of contact C and connectionless and there is nothing to a rotation starting position, the moving terminal S connects position detecting

switch SW7 of 33 worm gear to the point of contact C. That is, position detecting switch SW7 rotated based on rotation of the direct-current motor 31, and when said worm gear 33 rotates one time and arrives at a rotation starting position, it is provided with the operating member 50 which makes the moving terminal S estrange from the point of contact C.

[0036] Compulsive door opening switch SW6 is connected to said direct-current motor 31. Compulsive door opening switch SW6 is the switch formed in the instrument panel of the driver's seat, the moving terminal S is connected to the positive electrode of a battery via an ignition key switch, and the point of contact d is connected to the direct-current motor 31.

[0037] Next, an operation of the door lock device constituted as mentioned above is explained. Now, if a door is shut, the latch cam 10 will be rotated in the counter clockwise direction in drawing 1 by the striker 12. And if it rotates to the position which the latch cam 10 shows to drawing 2, the nail 25 of the ratchet 20 will engage with the engagement face 15 of a latch cam. Therefore, it is not released, if the ratchet 20 resists the elastic force of the 2nd spring 22 to the position in which the nail 25 secedes from the engagement face 15 and it does not rotate to clockwise direction. In this state, position detecting switch SW7 is in an OFF state, and the worm gear 33 is in a rotation starting position.

[0038] If any one of the 1st and 2nd lock switch SW1 and the SW2 is operated to a lock direction at this time, the moving terminal S of that switch will be connected with the lock side edge child L. The 2nd exiting coil 43 of the ratching relay 41 is magnetized by this. It is connected to the point of contact B by magnetization of this 2nd exiting coil 43, and the moving terminal S of the ratching relay 41 is held.

[0039] And in this state, since the moving terminal S and the point of contact A of the ratching relay 41 are not connected even if it carries out ON operation of SWthe 1st [ or ], the 2nd door opening switch SW4, or 5, positive voltage VB of a battery is not impressed and the direct-current motor 31 is not driven. That is, the door is a locked position. When it becomes more than the speed which the vehicle speed defined beforehand and the 3rd moving terminal S of lock switch SW3 is connected to the lock side edge child L, it will be in a locked position similarly.

[0040] If any one of the 1st and 2nd lock switch SW1 and the SW2 is operated in the unlocking direction that this locked position should be canceled, the moving terminal S of that switch will be connected with the unlocking side edge child U. The 1st exiting coil 42 of the ratching relay 41 is magnetized by this. The moving terminal S of the ratching relay 41 will be connected to the point of contact A by magnetization of this 1st exiting coil 42, and maintenance, i.e., a door, will be in an unlock condition.

[0041] And in this unlock condition, if ON operation of SWthe 1st [ or ], the 2nd door opening switch SW4, or 5 is carried out, positive voltage VB of a battery will be impressed to the direct-current motor 31 via the moving terminal S of the ratching relay 41. The drive start of the direct-current motor 31 is carried out, and it rotates the worm gear 33. The driving cam 34 is also rotated with rotation of the worm gear 33, and it is made to rotate to the position which engages with the lock pin 26 promptly and shows drawing 2 the ratchet 20 according to a two-dot chain line.

[0042] Since position detecting switch SW7 is turned on from OFF even if the 1st or the 2nd door opening switch SW4, and SW5 are turned off in the middle of this rotation, driving it is continued until the worm gear 33 turns the direct-current motor 31 and it reaches to a rotation starting position.

[0043] If the ratchet 20 rotates to the position of a two-dot chain line, the engagement state (latch condition) will be released and the latch cam 10 will be in the Anh latch condition. As a result, if a handle etc. are lengthened as it is, a door can be opened easily.

[0044] And if the worm gear 33 reaches to a rotation starting position, position detecting switch SW7 will turn off and the direct-current motor 31 will stop. In a locked position, if ON operation of compulsive door opening switch SW6 is carried out, the direct-current motor 31 is driven and can make a door the Anh latch condition compulsorily.

[0045] Next, the feature of the above-mentioned embodiment is indicated below.

(1) According to this embodiment, the connection lever which transmits the operating physical force based on operation of the handle of a door to a ratchet like before is not provided. Latch

ANRATCHI and lock unlocking were made to perform by the driving cam 34 provided in the worm gear 33 rotated with the direct-current motor 31 as the substitute. Therefore, the complicated link mechanism established between a conventional connection lever, its connection lever, and ratchet becomes unnecessary. As a result, while part mark of the part decrease, a miniaturization can be attained, and moreover, cost reduction can be planned.

[0046](2) According to this embodiment, a locked position is not released unless the direct-current motor 31 is rotated at least. Therefore, a thin plate can be inserted from the crevice between door glass like before, said link mechanism can be operated, and a locked position cannot be made to cancel unlawfully, but theft prevention can be aimed at in this embodiment.

[0047](3) According to this embodiment, a locked position cuts and changes to an unlock condition by rotation of the direct-current motor 31. Therefore, the unpleasant operating sound of the link mechanism generated when operating said link mechanism between a locked position and an unlocked position like before is not generated.

[0048](4) At this embodiment, it is carrying out only by the drive of the direct-current motor 31 without rotating the ratchet 20 based on routine, such as a connection lever. And the drive of the direct-current motor 31 is performed based on the electrical signal only by operation of each switches SW1-SW7, i.e., a switch. Therefore, even if various conditions which carry out drive controlling of the direct-current motor 31 using switches other than the above-mentioned each switch SW1 – SW7, etc. are added and it newly makes the state of lock unlocking and latch ANRATCHI, design correspondence can be carried out easily. For example, it is made for an air bag's operation point of contact to be interlocked with, and it can also perform easily that an air bag makes a door the Anh latch condition after after-operation fixed time lapse only by adding electric constitution, without adding mechanical constitution.

[0049](A 2nd embodiment) As for other composition, it is the same that the composition of the controlling circuit part 40 which described this embodiment by a 1st embodiment is only different. Therefore, only the controlling circuit part 40 from which explanation is expedient-upper-different is explained.

[0050]In drawing 6, the controlling circuit part 40 comprises the enhancement type P channel MOS transistor (it is called a PMOS transistor) T1, PNP transistor T2, NPN transistor T3, and three resistance R1-R3.

[0051]As for PMOS transistor T1, the gate is connected to the unlocking side edge child U of the 1st and 2nd lock switch SW1 and SW2. The drain of PMOS transistor T1 is connected to the point of contact a of said 1st [ the ] and the 2nd door opening switch SW4, and SW5, and the source is connected to the direct-current motor 31.

[0052]The base of PNP transistor T2 is connected to the gate of PMOS transistor T1 via the resistance R2. The collector of PNP transistor T2 is connected to the lock side edge child L of said 1st [ the ] – the 3rd lock switch SW1-SW3, and, as for the emitter, positive voltage VB of said battery is impressed.

[0053]The collector of PNP transistor T2 is connected to the base of NPN transistor T3 via the resistance R3. Positive voltage VB of said battery is impressed via the resistance R1 to the collector of NPN transistor T3, and the emitter is grounded. The node of the resistance R2 and the resistance R1 is connected to the gate of said PMOS transistor T1.

[0054]Therefore, if any one of the 1st and 2nd lock switch SW1 and the SW2 is operated to a lock direction, the moving terminal S of the switch will be connected with the lock side edge child L, and the lock side edge child L will be grounded. Therefore, each transistor T1 – T3 will be in an OFF state. Since NPN transistor T3 turns off at this time, positive voltage VB is impressed to that gate, and PMOS transistor T1 holds the OFF state.

[0055]And in this state, even if it carries out ON operation of SWthe 1st [ or ], the 2nd door opening switch SW4, or 5, since PMOS transistor T1 is in an OFF state, positive voltage VB of a battery is not impressed and the direct-current motor 31 is not driven. That is, the door is a locked position.

[0056]If any one of the 1st and 2nd lock switch SW1 and the SW2 is operated in the unlocking direction that this locked position should be canceled, the moving terminal S of that switch will be connected with the unlocking side edge child U. By this, it will become the potential with

which the unlocking side edge child U was grounded, and PMOS transistor T1 will be in an ON state. By one of this PMOS transistor T1, a door will be in an unlock condition.

[0057]In this unlock condition, even if said 1st and 2nd lock switch SW1 and SW2 are canceled, PMOS transistor T1 holds an ON state. That is, one [ one / of PMOS transistor T1 / PNP transistor T2 ]. One [ one of this PNP transistor T2 is answered, and / NPN transistor T3 ]. As a result, the potential concerning the gate of PMOS transistor T1 falls, and even if said moving terminal S estranges from the unlocking side edge child U, the state, one [ PMOS transistor T1 ], is held.

[0058]And in this unlock condition, if ON operation of SWthe 1st [ or ], the 2nd door opening switch SW4, or 5 is carried out, positive voltage VB of a battery will be impressed to the direct-current motor 31 via PMOS transistor T1. The drive start of the direct-current motor 31 is carried out, and it rotates the worm gear 33. The driving cam 34 is also rotated with rotation of the worm gear 33, and it is made to rotate to the position which engages with the lock pin 26 promptly and shows drawing 2 the ratchet 20 according to a two-dot chain line.

[0059]Since position detecting switch SW7 is turned on from OFF even if the 1st or the 2nd door opening switch SW4, and SW5 are turned off in the middle of this rotation, driving it is continued until the worm gear 33 turns the direct-current motor 31 and it reaches to a rotation starting position.

[0060]If the ratchet 20 rotates to the position of a two-dot chain line, the engagement state (latch condition) will be released and the latch cam 10 will be in the Anh latch condition. As a result, if a handle etc. are lengthened as it is, a door can be opened easily.

[0061]Therefore, it has the same operation effect as a 1st embodiment described above also in this embodiment.

(A 3rd embodiment) This embodiment is described according to drawing 7. Only the portion of explanation which is different from a 1st embodiment for convenience is explained.

[0062]In drawing 7, the moving terminal S of the 1st ~ the 3rd lock switch SW1~SW3 is connected to the positive electrode of a battery, and positive voltage VB is impressed. the [ the 1st ~ ] — the lock side edge child L of three is connected to the controlling circuit part 40 via the diodes D1~D3, respectively. The unlocking side edge child U of the 1st and 2nd lock switch SW1 and SW2 is connected to the controlling circuit part 40 via the diode D4 and D5, respectively.

[0063]On the other hand, the moving terminal S of the 1st and the 2nd door opening switch SW4, and SW5 is connected to said direct-current motor 31. The point of contact a of the 1st and the 2nd door opening switch SW4, and SW5 is connected to the controlling circuit part 40.

[0064]Next, the controlling circuit part 40 is explained. The controlling circuit part 40 comprises the resistance R4~R6 of 51 or 3 relays which consist of PNP transistor T4, the exiting coil RY, and the relay contact RB, the capacitor 52, and the zener diode 53.

[0065]The base of said PNP transistor T4 is connected with the lock side edge child L of said 1st [ the ] ~ the 3rd lock switch SW1~SW3 while it is grounded via the resistance R4 and R5. The collector of PNP transistor T4 is grounded via the resistance R6 and the exiting coil RY while being connected with the unlocking side edge child U of the 1st and 2nd lock switch SW1 and SW2. The emitter of PNP transistor T4 is connected to the positive electrode of said battery via the relay contact RB while being connected with the point of contact a of said 1st [ the ] and the 2nd door opening switch SW4, and SW5.

[0066]The capacitor 52 is connected to said resistance R5 in parallel. The node of the resistance R6 and the exiting coil RY is grounded via the zener diode 53. Therefore, if SWeither the 1st and 2nd lock switch SW1 or 2 is operated in the unlocking direction and the moving terminal S is connected to the unlocking side edge child U, the exiting coil RY will be magnetized and the relay contact RB will close it. As a result, positive voltage VB of a battery will be impressed to the point of contact a of the 1st and the 2nd door opening switch SW4, and SW5, and will be in an unlock condition. At this time, positive voltage VB is impressed also to the emitter of the transistor T4, and energizing said exiting coil RY is continued. That is, self-hold of the relay 51 is carried out. The charging time of said capacitor 52 decides on the time of this self-hold. If ON operation of SWthe 1st [ or ], the 2nd door opening switch SW4, or 5 is carried

out during this time by which self-hold is carried out, positive voltage VB will be impressed and the direct-current motor 31 will start a drive. Therefore, a door will be in the Anh latch condition.

[0067]On the other hand, if the moving terminal S of either the 1st ~ the 3rd lock switch SW1-SW3 is connected to the lock side edge child L, since positive voltage VB is impressed to the base, PNP transistor T4 will be turned off. As a result, self-hold will be canceled promptly and the relay 51 in a self-hold state will be from an unlock condition in a locked position.

[0068]In the state where the 1st ~ the 3rd lock switch SW1-SW3 are not operated, since the exiting coil RY is not energized but the relay contact RB is carrying out the open circuit, it will be held at the locked position.

[0069]Therefore, also in this embodiment, it has the same operation effect as said 1st embodiment.

(A 4th embodiment) This embodiment is described according to drawing 8. Only the portion of explanation which is different from a 1st embodiment for convenience is explained. 1st OR circuit 61 inputs the door unlocking signal of positive voltage VB, when said 1st and 2nd lock switch SW1 and SW2 are operated in the unlocking direction. 1st OR circuit 61 outputs the door-lock signal to the controlling circuit part 40. 2nd OR circuit 62 inputs the door-lock signal of positive voltage VB, when said 1st [ the ] ~ the 3rd lock switch SW1-SW3 are operated to a lock direction. 2nd OR circuit 62 outputs the door unlocking signal to the controlling circuit part 40.

[0070]The controlling circuit part 40 consists of the flip-flop circuit 63 which consists of two OR circuits 63a and 63b. And if a door unlocking signal is inputted from said 1st OR circuit 61, the signal (unlocking signal) of high potential "logical-value "1"" will output the flip-flop circuit 63 to AND circuit 64 of the next step, and it will hold the state. If a door-lock signal is inputted from said 2nd OR circuit 62, the signal (lock signal) of low voltage "logical-value "0"" will output the flip-flop circuit 63 to AND circuit 64 of the next step, and it will hold the state.

[0071]3rd OR circuit 65 inputs the door opening signal of positive voltage VB, when ON operation of said 1st [ the ] and the 2nd door opening switch SW4, and SW5 is carried out. 3rd OR circuit 65 answers the door opening signal, and outputs the opening signal of high potential "logical-value "1"" to said AND circuit 64. In AND circuit 64, the output terminal is connected to the power switch 67 via 4th OR circuit 66. That is, if an opening signal is outputted from 3rd OR circuit 65 when the unlocking signal is outputted from the flip-flop 63, the opening signal will be supplied to the power switch 67 via AND circuit 64 and 4th OR circuit 66. When the lock signal is outputted from the flip-flop 63, even if an opening signal is outputted from 3rd OR circuit 65, the opening signal is prevented in AND circuit 64, and is not supplied to the power switch 67.

[0072]4th OR circuit 66 inputs positive voltage VB via said position detecting switch SW7. That is, when position detecting switch SW7 is in an ON state, said positive voltage VB is supplied to the power switch 67 via 4th OR circuit 66 as the 2nd opening signal.

[0073]If said power switch 67 inputs said opening signal or the 2nd opening signal, ON operation of it will be carried out and it will impress positive voltage VB of a battery to said direct-current motor 31. On the contrary, when not having inputted said opening signal and the 2nd opening signal, the power switch 67 intercepts supply of positive voltage VB to the direct-current motor 31.

[0074]Therefore, when a door unlocking signal is inputted into the flip-flop 63, an unlocking signal will be inputted into AND circuit 64 from the flip-flop 63. As a result, if it will be in an unlock condition and an opening signal is inputted from 3rd OR circuit 65, the direct-current motor 31 will be in the state which it drives, and rotation control is carried out like each embodiment besides the above, and can open a door.

[0075]When a door-lock signal is inputted into the flip-flop 63, a lock signal will be inputted into AND circuit 64 from the flip-flop 63. As a result, even if it will be in a locked position and an opening signal is inputted from 3rd OR circuit 65, the direct-current motor 31 will be in the state where it does not drive but a door can be opened, like an embodiment besides the above.

[0076]Thus, also in this embodiment, it has the same operation effect as said 1st embodiment. This invention is not limited to each above-mentioned embodiment, and may be carried out in

the following modes.

[0077](1) Although the direct-current motor 31 constituted the actuator from said embodiment, it may replace with the electromagnetism solenoid 70 shown in drawing 9, and may carry out. In this case, since the electromagnetism solenoid 70 makes it rotate directly, the gear 32, the worm gear 33, and driving cam 34 grade become unnecessary. It may replace with the direct-current motor 31, and may carry out by other motors, such as a step motor. Of course, an actuator is carried out, and electrically, drive controlling may carry it out, as oil pressure or an air cylinder is carried out.

[0078](2) Although the driving cam 34 was rotated via the form wheel 33 in said example, it may be made to rotate the driving cam 34 with a direct-output axis.

(3) Although said 1st and 2nd lock switch SW1 and SW2 were the switches which can set up two states, a locked position and an unlock condition, this may be divided into the switch for a lock, and the switch for unlocking, and they may carry it out.

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[Translation done.]

**\* NOTICES \***

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

Drawing 1)The important section front view for explaining the ratchet mechanism built in the door.

Drawing 2)The important section front view showing the latch condition of a ratchet mechanism similarly.

Drawing 3)It is an important section front view showing a locking mechanism.

Drawing 4)The explanatory view explaining the relation between a locking mechanism and a ratchet mechanism

Drawing 5)The electric diagram explaining the electric constitution of a door lock device.

Drawing 6)The electric diagram of the door lock device explaining a 2nd embodiment.

Drawing 7)The electric diagram of the door lock device explaining a 3rd embodiment.

Drawing 8)The electric diagram of the door lock device explaining a 4th embodiment.

Drawing 9)The important section front view explaining example of another of an actuator.

**[Description of Notations]**

10 [ -- The engagement face as an engagement part, ] -- A latch cam, 12 -- A striker, 13 -- A crevice, 15 16 -- The 1st spring as the 1st elastic member, 20 -- Ratchet, 22 -- The 2nd spring 22 and 31 as the 2nd elastic member -- Direct-current motors 31 and 34 -- Driving cam, 40 [ -- Position detecting switch. ] -- A controlling circuit part, SW1~SW3 -- The 1st as a lock switch and an unlocking switch ~ the 3rd lock switch, SW4, SW5 -- The 1 and the 2nd door opening switch, SW7

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[Translation done.]

**\* NOTICES \***

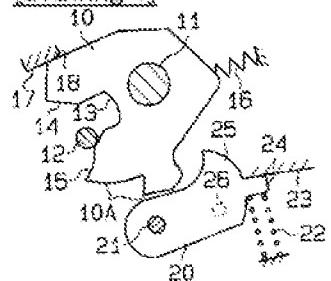
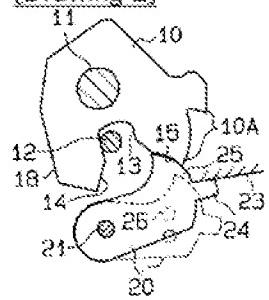
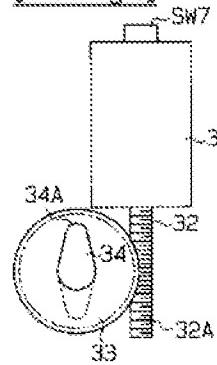
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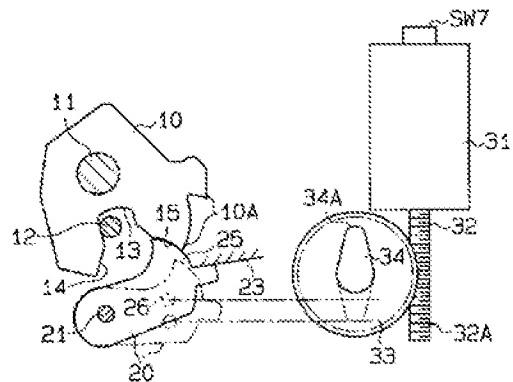
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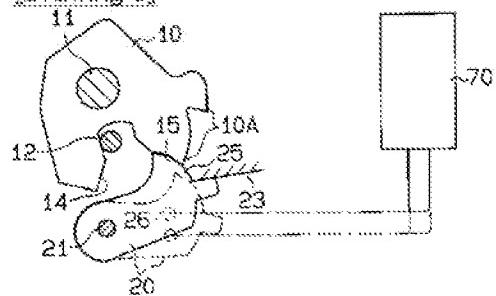
**DRAWINGS**

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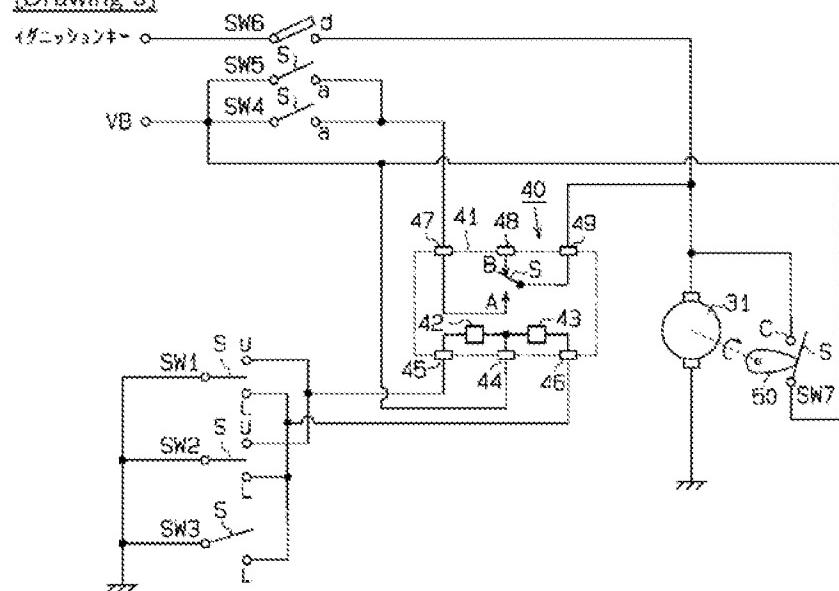
**[Drawing 1]****[Drawing 2]****[Drawing 3]****[Drawing 4]**



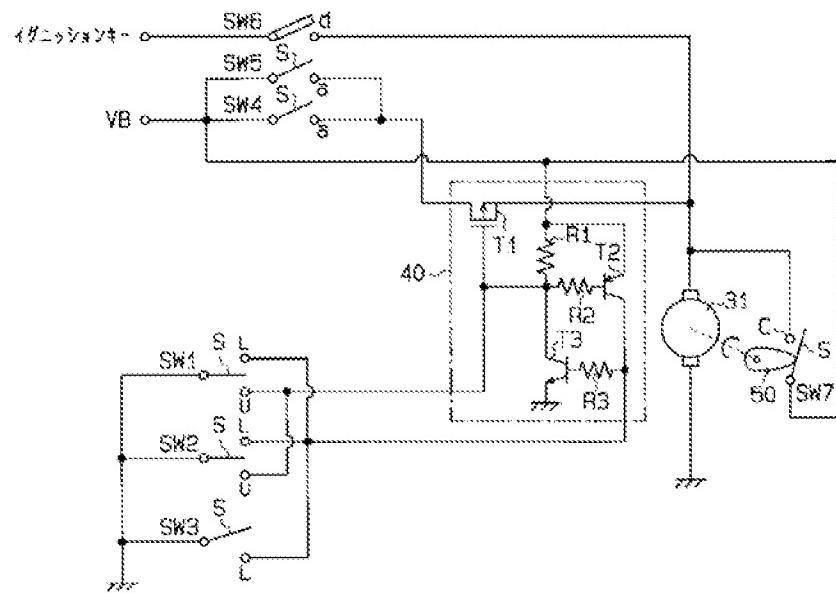
[Drawing 9]



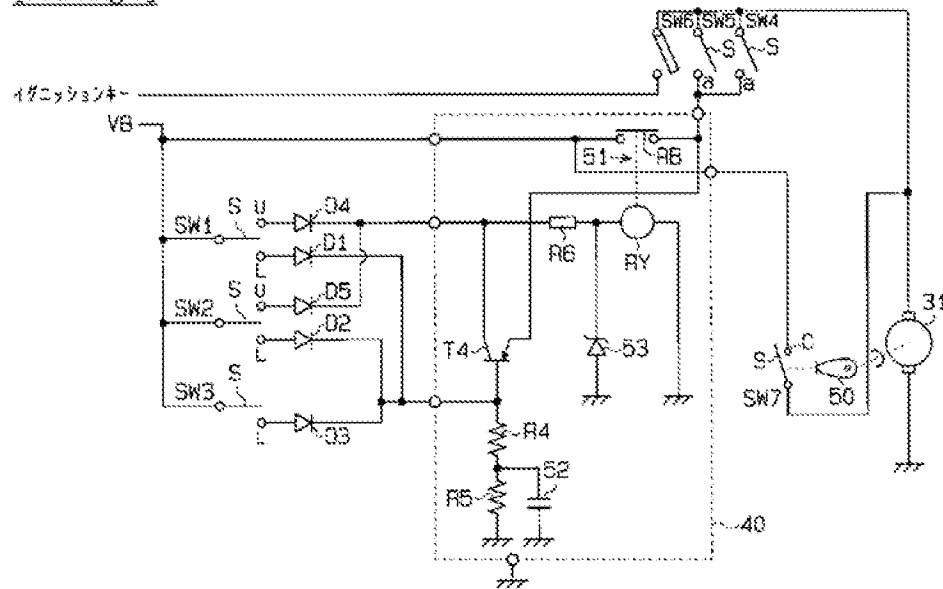
[Drawing 5]



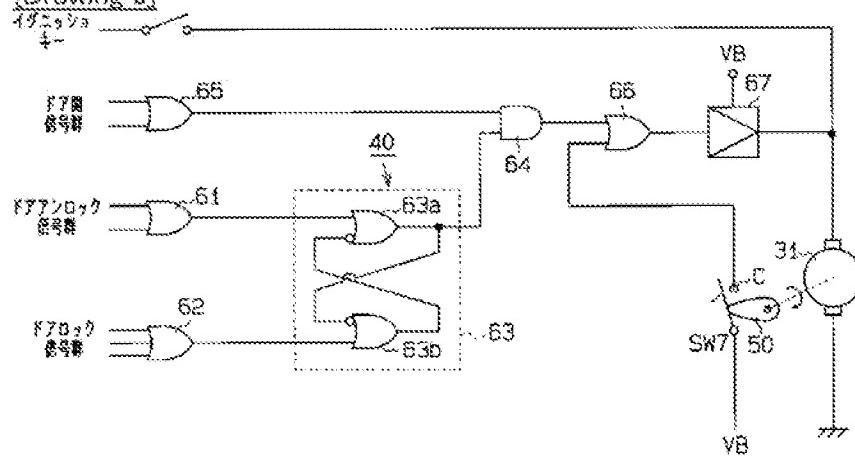
[Drawing 6]



[Drawing 7]



[Drawing 8]



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[Translation done.]